Teaching Diagnostic Error Using Problem-Based Learning: **A Case of Cellulitis Misdiagnosis**

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Abstract

Learning objectives

1. Understand the Problem-Based Learning approach to medical student education.
2. Identify the cognitive reasons for cellulitis diagnostic error.
3. Describe the teaching of diagnostic error within the context of the PBL method of medical education.

Case information

This is a case of a 68-year-old woman presenting to the emergency department with a swollen, erythematous leg. The emergency department diagnosed her with cellulitis and admitted her for intravenous antibiotics. On the third morning the patient developed a rash. A dermatology consult resulted in the diagnosis of stasis dermatitis and of an antibiotic medication reaction, rather than cellulitis.

Discussion

Many medical schools have adopted the Problem-Based Learning (PBL) educational method. PBL is a methodology used to encourage self-directed group learning and to practice differential diagnosis. PBL is student directed and involves critical analysis of the literature, teamwork, group interaction, and cooperation.[1] We developed a PBL around a case of presumed cellulitis as a method to introduce first-year medical students to diagnostic error. The new PBL was piloted in 2010, and then run successfully as part of the curriculum in 2011. Students generally were positive in the evaluation of the PBL. The subsection of the class that was asked to evaluate the PBL and accompanying lecture rated it 4.4 out of 5 points. PBL is a logical place to introduce diagnostic error because it is where students first learn to generate a differential diagnosis. This PBL case was well-received, and taught students about a common specific diagnostic error in addition to diagnostic error theory.

Why Teach Diagnostic Error in PBL?

PBL is an ideal medium to introduce diagnostic error because it is where students first learn to think through a case and make a diagnosis. The methodology was introduced at McMaster University in 1969.[2] Data from 2003-2004 note the prevalence of PBL to be 70% in US medical schools, with 6% of schools using it for more than 50% of curricular time and 22% using it for less than 10% of curricular time.[3] PBL puts the students in charge of the case, allowing them to experience firsthand the confusion and potential for error rather than having it explained in a lecture. A PBL with a focus on diagnostic error reinforces and contrasts how patients present with typical presentations and variant presentations, a key learning objective for medical students.

University of Rochester School of Medicine students sit down to begin their problem-based learning activity. The case of "The Recurring Problem" was solved over three days.

Teaching Objectives for the Diagnostic Error-Focused PBL

We chose a problem area that has been shown to be a frequent cause of diagnostic error: the patient presenting with redness of the lower extremity and suspected cellulitis. Awareness and understanding are taught by allowing students to experience how a common diagnostic error can be made by well-intentioned providers. Our teaching objectives included:

1. Teaching the causes of diagnostic error, including premature closure, overconfidence, and other reasons for cognitive mistakes.
2. Showing how an ultimately unnecessary test can seem logical to order, yet contribute nothing to the diagnosis and potentially reinforce a misdiagnosis (eg, skin swab).
3. Teaching how to properly incorporate a primarily "rule-out" test into a differential diagnosis (eg, D-dimer).
4. Teaching how to use a symptom-based decision support program to quickly build an appropriate differential.
5. Showing how Internet searches can compound misdiagnosis when they are based on diagnostic suspicion or past medical problems rather than the presenting symptoms.

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